

AMENDMENTS TO THE CLAIMS

This listing of claims will replace all prior versions, and listings, of claims in the application.

Listing of Claims:

1. (Currently Amended) A graphics processor, comprising:
a multithreading, multi-core graphics engine to process pixel data;
a render-cache, readily accessible to the graphics engine, to store pixel data; and,
a render-cache controller to maintain the order in which ~~threads are each thread~~
~~is~~ dispatched to the graphics engine, and to maintain data coherency between the
render-cache and a main memory.
2. (Original) The graphics processor of claim 1, further including:
raster logic to generate threads, each thread including at least one cache-line
address indicating the location of pixel data in the render-cache; and,
a thread dispatcher to dispatch each thread to the graphics engine only when the
render-cache controller indicates that the at least one cache-line address is valid.
3. (Original) The graphics processor of claim 2, wherein the multithreading, multi-
core graphics engine is to process pixel data for rendering 3D graphics.
4. (Original) The graphics processor of claim 2, wherein the at least one cache-line
address is valid if the render-cache controller indicates a cache hit during a look-up
operation, and the pixel data stored at the at least one cache-line address is not in-flight.
5. (Original) The graphics processor of claim 2, wherein the render-cache controller
is to block a thread from dispatching to the graphics engine if the thread specifies a
cache-line address of the render-cache containing a pixel in flight.

6. (Currently Amended) The graphics processor of claim 2, wherein the render-cache controller comprises:

a content addressable memory to map pixel coordinates to a cache-line address of the render-cache, the address specifying a location in the render-cache where pixel data corresponding to the pixel coordinates is stored;

a pixel mask array having a mask bit for every entry of the content addressable memory, each mask bit to indicate whether previously allocated pixel data is in flight; and,

a cache-line status array with a status bit for every entry of the content addressable memory, each status bit to indicate the availability of a cache-line in the render-cache.

7. (Original) The graphics processor of claim 6, wherein the render-cache controller further comprises a pipeline interface to receive cache-line addresses when the graphics engine reads from or writes to the render-cache.

8. (Currently Amended) The graphics processor of claim 7, wherein the render-cache controller maintains the in-flight status of pixel data stored in the render-cache by receiving the cache-line addresses from the pipeline interface.

9. (Original) The graphics processor of claim 8, wherein the render-cache controller changes the status of pixel data stored at a particular cache-line address to indicate that the pixel data is in-flight when the render-cache controller receives the address of the cache-line via the pipeline when the graphics engine reads the pixel data from the cache-line associated with the cache-line address.

10. (Original) The graphics processor of claim 8, wherein the render-cache controller changes the status of pixel data stored at a particular cache-line address to indicate that the pixel data is no longer in flight when the render-cache controller receives the address of the cache-line via the pipeline when the graphics engine writes the pixel data to the cache-line associated with the cache-line address.

11. (Currently Amended) A render-cache controller comprising:
 - a content addressable memory to map pixel coordinates to a cache-line address of a render-cache, the cache-line address specifying a location in the render-cache where pixel data corresponding to the pixel coordinates is stored;
 - a pixel mask array having a mask bit for every entry of the content addressable memory, each mask bit to indicate whether previously allocated pixel data is in flight; and,
 - a cache-line status array with a status bit for every entry of the content addressable memory, each status bit to indicate the availability of a cache-line in the render-cache.
12. (Currently Amended) The render-cache controller of claim 11, ~~furthering further~~ comprising:
 - a pipeline interface to receive a cache-line address when a graphics engine reads or writes the pixel data to the render-cache.
13. (Currently Amended) The render-cache controller of claim 12, wherein the pixel mask array is to set ~~a~~the mask bit corresponding with a cache-line address of the render-cache when the pixel data stored at the cache-line address is read by the graphics engine and the cache-line address is received by the render-cache controller via the pipeline interface, the set mask bit indicating that the pixel data read from the cache-line address is in flight.
14. (Currently Amended) The render-cache controller of claim 12, wherein the pixel mask array is to reset ~~a~~the mask bit corresponding with a cache-line address of the render-cache when pixel data is written by the graphics engine to the cache-line address and the cache-line address is received by the render-cache controller via the pipeline interface, the reset mask bit indicating that the pixel data written to the cache-line address is not in flight.

15. (Currently Amended) The render-cache controller of claim 12, wherein the content addressable memory blocks the thread dispatcher from dispatching threads generated by raster logic if the threads include cache-line addresses of the render-cache containing the pixel data in flight.
16. (Currently Amended) The render-cache controller of claim 12, wherein the pixel mask array indicates whether cache-line addresses included in the thread are associated with the pixel data in flight.
17. (Currently Amended) The render-cache controller of claim 12, wherein the pixel data is in flight if it has been read by the graphics engine more recently than it has been written to the render-cache.
18. (Currently Amended) A method to pre-allocate pixel data to a render-cache, the method comprising:
 - checking a content addressable memory to determine whether pixel data for a particular pixel has been previously allocated to the render-cache;
 - if the pixel data for the particular pixel has not been previously allocated to the render-cache then
 - checking a cache-line status array to determine an address of an available cache-line in the render-cache,
 - evicting pixel data from the address of the available cache-line, writing the pixel data to the address of the available cache-line in the render-cache, and
 - setting a bit in a pixel mask array to indicate that the pixel data written to the address of the available cache-line is in flight; and
 - if the pixel data for the particular pixel has been previously allocated to the render-cache then
 - checking ~~at~~the pixel mask array to determine whether the previously allocated pixel data is in flight,
 - stalling, if the previously allocated pixel data is in flight, and

dispatching a thread to the graphics engine if the previously allocated pixel data is not in-flight.

19. (Currently Amended) The method of claim 18, wherein checking the content addressable memory to determine whether the pixel data for a particular pixel has been previously allocated to the render-cache includes comparing the X and Y coordinates of the particular pixel to X and Y coordinates of pixel data stored in the content addressable memory and determining that the pixel data has been previously allocated if the comparison results in a match.
20. (Original) The method of claim 18, wherein checking a cache-line status array to determine an address of an available cache-line in the render-cache includes selecting an available cache-line based on a cache-line selection algorithm.
21. (Original) The method of claim 20, wherein the cache-line selection algorithm is based on a least recently used selection algorithm.
22. (Currently Amended) The method of claim 18, wherein evicting the pixel data from the address of the available cache-line includes writing the pixel data to a memory.
23. (Currently Amended) A portable media device comprising:
 - a CPU;
 - a main memory;
 - a graphics processor, the graphics processor comprising a multithreading, multi-core graphics engine to generate graphics by processing pixel data, a render-cache to store the pixel data, and a render-cache controller to maintain the order in which threads are dispatched to the graphics engine and to maintain data coherency between the render-cache and the main memory; and
 - a battery to provide power to the CPU, the main memory, and the graphics processor.

24. (Original) The portable media player of claim 23, further comprising:
a liquid crystal display to display the graphics generated by the graphics processor.
25. (Currently Amended) The portable media player of claim 23, wherein the graphics processor further comprises a raster logic to generate threads, each thread including at least one cache-line address indicating the location of the pixel data in the render-cache, and a thread dispatcher to dispatch each thread to the graphics engine only when the render-cache controller indicates that the at least one cache-line address is valid.
26. (Original) The portable media player of claim 25, wherein the at least one cache-line address is valid if the render-cache controller indicates a cache hit during a lookup operation, and the pixel data stored at the at least one cache-line address is not in-flight.
27. (Original) The portable media player of claim 26, wherein the graphics engine is to generate 3D graphics.